WHAT IS CLAIMED IS:

1. An apparatus for controlling an ignition timing of an engine, comprising:

an ignition timing calculator for adding a fluctuating component to a set ignition timing to calculate a final ignition timing for igniting the engine;

a mean effective pressure calculator for calculating an indicated mean effective pressure for an in-cylinder pressure detected when the engine has been ignited according to the final ignition timing;

an MBT calculator for estimating an ignition timing characteristic curve that represents a correlation between the indicated mean effective pressure and the fluctuating component and for determining an optimum ignition timing from the characteristic curve; and

a controller for controlling the set ignition timing to converge to the optimum ignition timing.

2. The apparatus of claim 1,

wherein the ignition timing characteristic curve is represented by a function, an input of the function being the fluctuating component and an output of the function being the indicated mean effective pressure;

wherein the MBT calculator further includes an identifier for identifying coefficients associated with the fluctuating component in the function based on the indicated mean effective pressure calculated by the mean effective pressure calculator to estimate the characteristic curve based on the identification of the coefficients.

3. The apparatus of claim 2, further comprising a generator for generating the fluctuating component,

wherein the generator generates the fluctuating component to meet

self-excitation conditions for identifying the coefficients of the function.

4. The apparatus of claim 2, wherein the identifier is further configured to:

determine update components for the coefficients so that an error between the indicated mean effective pressure calculated by the mean effective pressure calculator and an estimated indicated mean effective pressure estimated from the function converges to zero;

add the update components to predetermined reference values to determine the coefficients, thereby causing the coefficients to converge to the reference values as the error converges to zero;

wherein the reference values are predetermined so that the control for controlling the set ignition timing to converge to the optimum ignition timing stops when the coefficients have converged to the reference values.

5. The apparatus of claim 2, wherein a limit process is applied to at least one of the coefficients so that it is prevented that the characteristic curve is estimated as a downward convex curve.

6. The apparatus of claim 1, wherein the mean effective pressure calculator is further configured to extract an alternating component from the detected in-cylinder pressure and to calculate the indicated mean effective pressure based on the alternating component.

7. The apparatus of claim 1, wherein the controller uses a response assignment control to control the set ignition timing, the response assignment control being capable of specifying a response characteristic of the set ignition timing to the optimum ignition timing.

8. A method for controlling an ignition timing of an engine, comprising the

steps of:

(a) adding a fluctuating component to a set ignition timing to calculate a final ignition timing for igniting the engine;

(b) calculating an indicated mean effective pressure for an in-cylinder pressure detected when the engine has been ignited according to the final ignition timing;

(c) estimating an ignition timing characteristic curve that represents a correlation between the indicated mean effective pressure and the fluctuating component;

(d) determining an optimum ignition timing from the characteristic curve; and

(e) controlling the set ignition timing to converge to the optimum ignition timing.

9. The method of claim 8,

wherein the ignition timing characteristic curve is represented by a function, an input of the function being the fluctuating component and an output of the function being the indicated mean effective pressure;

wherein the step (c) further comprises the step of:

(c1) identifying coefficients associated with the fluctuating component in the function based on the indicated mean effective pressure to estimate the characteristic curve based on the identification of the coefficients.

10. The method of claim 9, further comprising the step of generating the fluctuating component to meet self-excitation conditions for identifying the coefficients of the function.

11. The method of claim 9, wherein the step (c1) further comprises the steps of:

determining update components for the coefficients so that an error between the indicated mean effective pressure calculated in the step (b) and an estimated indicated mean effective pressure estimated from the function converges to zero; and

adding the update components to predetermined reference values to determine the coefficients, thereby causing the coefficients to converge to the reference values as the error converges to zero;

wherein the reference values are predetermined so that the control for controlling the set ignition timing to converge to the optimum ignition timing stops when the coefficients have converged to the reference values.

12. The method of claim 9, further comprising the step of:

applying a limit process to at least one of the coefficients so that it is prevented that the characteristic curve is estimated as a downward convex curve.

13. The method of claim 8, wherein the step (b) further comprises the steps of:

extracting an alternating component from the detected in-cylinder pressure; and

calculating the indicated mean effective pressure based on the alternating component.

14. The method of claim 8, wherein the step (e) further comprises the step of:

using a response assignment control to control the set ignition timing, the response assignment control being capable of specifying a response characteristic of the set ignition timing to the optimum ignition timing.